Sept. 15, 1925. 1,553,616

M. W. JOHNSON

HYDRAULIC FLUSHING VALVE FOR WATER CLOSET TANKS

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Fig. 1

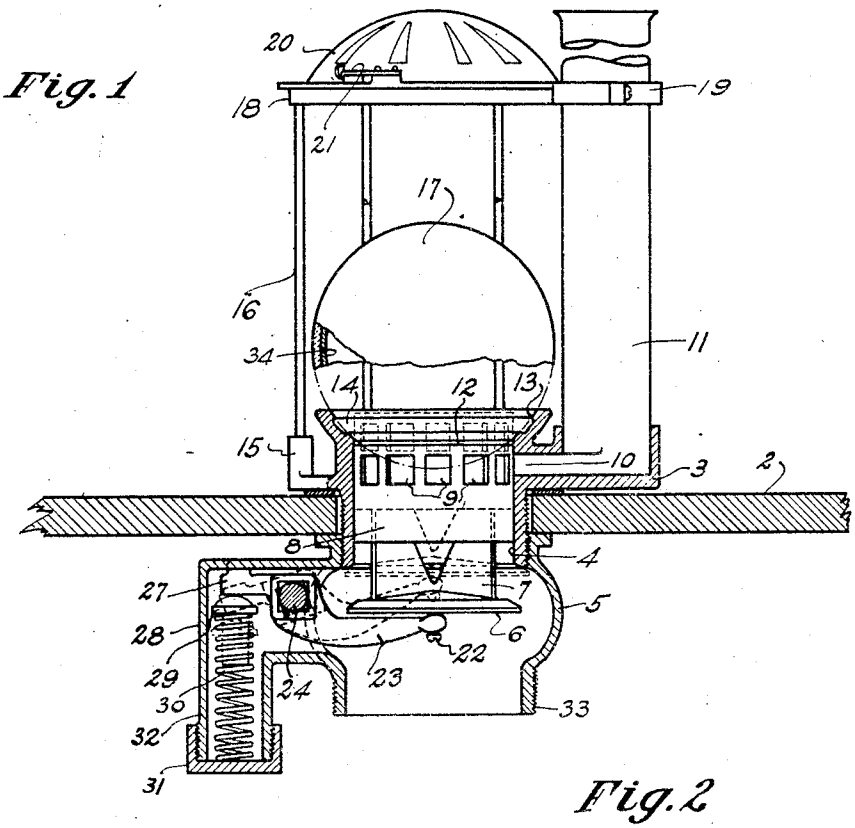
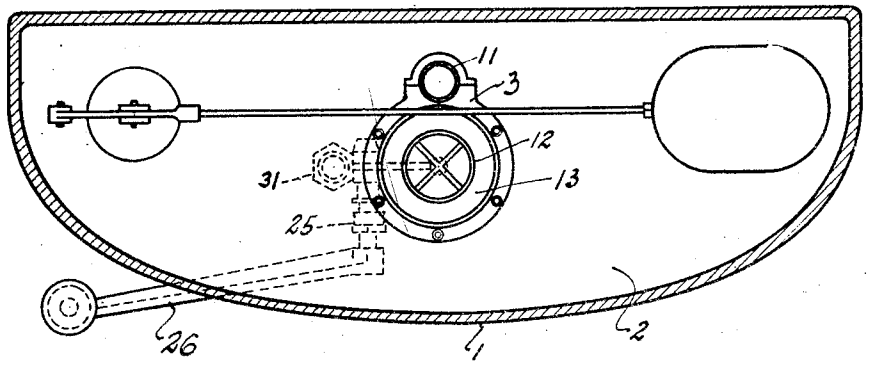


Fig. 2



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UNITED STATES PATENT OFFICE.

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HYDRAULIC FLUSHING VALVE FOR WATER-CLOSET TANKS.

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To all whom it may concern:

Be it known that I, MARK W. JOHNSON, a citizen of the United States of America, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Hydraulic Flushing Valves for Water-Closet Tanks, of which the following is a specification.

My invention relates to a hydraulic flushing valve for water closet tanks, and its object is to devise a flushing float valve so simple in its construction, so reliable in its method of operation, so free from liability to disarrangement of parts that might cause leakage, and so readily replaced when worn, that it will take the place of the present flush valve appliances for closet tanks.

The prime object of my invention is to design a flushing valve which shall make use of a freely floating spherical flush ball valve which being without any attached guide element and entirely unincumbered in its movements, is always free to assume a correct non-leaking position on the flush valve seat.

A further object of my invention is to provide, at the least possible expense and with no material change in the present flush valve seats, a guide or cage within which the free movements of the float ball valve are confined and which is adapted to guide the valve towards its seat without however interfering with its free movement as it seats itself.

A further object of my invention is to devise a simple and effective means for operating the float ball valve and to this end my invention contemplates broadly any available means for equalizing the hydraulic pressure all around the ball and thus permitting it to rise from its seat and float to the top of its cage. Preferably, I utilize a hand operated trip means to lift the valve from its seat in association with means to counteract or shut off the tank discharge temporarily so that the outflow of water under the valve will not interfere with the equalization of pressure about the float ball valve which is essential to enable the valve to float upward out of position so as to be unaffected by the flushing operation. It is to be understood that such mechanical valve operating appliance is merely that considered preferable in that it is more direct in its action, capable of being very simply embodied and economically constructed, and because for its operation it requires a crank or lever appliance such as has been in customary use for operating closet flushing valves.

My invention also comprises the novel details of construction and arrangements of parts, which in their preferred embodiment only are illustrated in the accompanying drawings which form a part of this specification, and in which:—

Fig. 1 is a vertical cross-sectional view through a portion of the bottom of a water closet tank showing the flush valve seat and the equalizing valve in elevation and the spherical float valve partly broken away, the dotted lines indicating the position of the equalizing valve when moved to trip the ball float valve.

Fig. 2 is a plan view in reduced scale looking down into a closet tank equipped with my valve invention, the float ball being omitted.

Similar reference numerals refer to similar parts throughout the drawings.

It is now well established that the most effective type of flush valve for use in connection with a tank system of flushing water closet bowls is by the use of a float valve within the flush tank. Such valves are subject, however, to objection chiefly because they get out of order so easily and so often, and this results from the necessity of providing a system of small delicate levers, links and pins, the purpose of which is to lift the rubber float ball off of the flush valve seat and to guide it in its return. Any disarrangement of the leverage system, any undue friction in the ball guides, or any rubbing or contact of the ball valve with any fixed part of the tank, will cause the ball valve to hang or to seat unequally, and, moreover, where such a float ball valve has attached to it a guide stem it must necessarily always present the same surface to the seat. The result of these unsatisfactory conditions is that the ball valve frequently hangs, its improper seating is the constant cause of leakage, and it has a relatively short life. It is of very considerable importance to be borne in mind that the result of these rather complicated and delicate appliances for the control of the operation of

closet flush valves has made the general public unable to repear flush valves when out of order by the substitution of a new float ball valve, and hence the public is subjected to an enormous up-keep expense which can be avoided by the provision of a simple free float ball valve which could be replaced by dropping a new ball into its cage.

In the preferred embodiment of my invention illustrated, I have shown a flushing tank 1, which may be of any standard design made of suitable material, and in the bottom 2 of this tank I have seated in a suitable hole provided therein a flush valve seat 3 which is quite similar to the present valve seats, differing only in the respects which will be later pointed out. Onto the threaded shank 4 of this valve seat below the tank I screw a valve fitting 5 adapted to receive the pressure equalizing disk valve 6. This valve 6 is adapted to engage a seat formed on or provided at the bottom end of the shank 4 and, when seated, to stop the outflow of water from the tank. The disk valve 6, on its upper face, carries four vertical spaced wings 7 which at their upper ends bear in spaced relation above the valve 6 a sleeve valve which works with a substantially fluid tight fit in the shank 4 and has near its upper end an annular series of ports 9 which in lowered position register with the discharge port 10 of the overflow pipe 11. This overflow pipe is mounted in the usual manner on the flush valve seat and its discharge port 10 enters said seat at one side in the manner well understood. The valve sleeve 8 at its upper end is open and has an annular bevelled face 12 which in lowered position stands slightly below a flush position with the bevelled face 13 and out of contact with the flush valve ball 17. In this face 13 I provide an annular groove 14 which reduces the contact area between ball and seat, and so increases the sealing pressure per square inch.

About the outer margin of the flange of the seat 3 I provide a series of spaced vertical sockets 15, each of which is adapted to receive one of the vertical wires 16 which form a cage for the guidance of the spherical ball float valve 17. These wires at their upper ends are received in or made fast to a top ring or frame 18 which is suitably connected by a clip 19 to the overflow pipe 11. Hinged on the top ring 18 is a suitable cap 20 provided with a latch or other equivalent means 21 for holding it in closed position on the ring 18.

The valve 6 has screwed into the center of its bottom a screw 22 which receives loosely the free end of the rocker arm 23 which is fast on a crank shaft 24. This shaft projects through a suitable packing gland 25, forwardly through the front wall of the fitting 5 and has fast on its outer end an elongated crank 26 which projects into convenient position for being depressed by hand to operate the valve mechanism. The rocker arm has an extension 27 beyond its connection to the shaft 24 which projects into an extension 28 of the fitting 5 and is engaged underneath by a plunger head 29 mounted on a coiled spring 30 which at its lower end is seated on a screw cap 31 in threaded engagement with the lower end of the cylindrical spring chamber 32 which underhangs from the outer end of the fitting extension 28. This cap 31 thus forms a removable seat for the spring whereby it can be readily replaced. The action of the spring is normally to hold the valves 6 and 8 in the lowered position, shown in full lines Fig. 1. When the free end of the lever is depressed the spring 30 will be compressed, the disk valve 6 will move into position to close the lower end of the seat shank 4 and sleeve 8 will rise sufficiently to blank off the port 10 and to lift the spherical float ball 17 above its seat. The water in the tank runs through the ports 9 in the sleeve and fills the shank above the disk valve 6, thus equalizing the water pressure on all sides of the ball. So long as the valve 6 is seated and the port 10 is blanked off there will be no outflow of water to create any suction on the ball 17 and the water having free access to the ball on all sides will cause it instantly to rise and float to the top of its cage. Thereupon, on release of the lever 26, the valve 6 will be opened by the action of the spring 30 and the ports 9 will move into register with the overflow port 10 and the flushing operation will proceed in normal manner. The valve body 5 has a threaded shank 33 which is of the same size as the shank 4 and is adapted to be coupled to the bowl connection, not shown, in the ordinary manner. The valve 6 and sleeve 8 in lowered position, offer no appreciable obstruction to the free and rapid discharge of water from the flushing tank.

While I have shown a mechanical appliance for unseating the float ball 17, it is to be understood that this may be accomplished in a variety of ways and that all such are within the contemplation of my invention. The ball may for greater life have a metal core 34 covered with rubber, thus causing it to hold its shape.

During the flushing operation, the ball will float down in its cage following the lowering water level in the tank and as the end of the flushing operation approaches the ball will work freely into position above and will settle down on its seat face 13 without there being any thing to interfere with this movement and without the ball ever presenting the same surface to the seat, thus causing a practically uniform wear over the entire surface area of the ball and avoid-

ing its being readily distorted from shape by the suction pull on it which very quickly results where the identical surface of the ball valve is caused always to contact with its seat.

Though I have described with great particularity the details of the embodiment of the invention herein shown, it is not to be construed that I am limited thereto, as changes in arrangement and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a hydraulic flushing valve means for closet tanks, a flush valve seat, a spherical float valve adapted to co-act with said seat, marginal means to freely guide said ball to and from its seat, and a manually operable valve adapted to close the flush valve port as it engages and unseats the float ball, said valve seat having an overflow pipe port and said valve means having an element adapted to blank off said port when in position to unseat the float ball.

2. A hydraulic flushing valve for water closet tanks, comprising a flush valve seat, a spherical free float ball valve adapted to co-act with said seat, a cage for the ball formed by marginal guides which confine the free movements of said ball, and a hinged top for the cage adapted to permit the ready removal and replacement of the ball.

3. In a hydraulic flushing valve mechanism for water closet tanks, a flush valve seat having an overflow pipe connected therewith, a freely movable float ball adapted to co-act with said seat, guides therefor, a sleeve valve movable through said seat to lift the ball having lateral ports adapted in raised position to clear the seat and permit the inflow of water below the ball, and means to check the outflow of water from said seat until the ball valve has floated away from it responsive to equalized hydraulic pressure on all sides thereof.

4. A hydraulic flushing valve mechanism, in accordance with claim 3, in which said seat has a lateral overflow port with which said ports in said sleeve valve are adapted to register only in its lowered position.

5. In a hydraulic flushing valve mechanism for water closet tanks, a tank having in its bottom a flush valve seat, a free float ball adapted to co-act with said seat, guide means for said ball, an overflow pipe having a discharge port entering said valve seat, a sleeve valve movable with a fluid tight fit through the seat and adapted to lift the ball therefrom, said valve having lateral ports which are exposed to the water in the tank when the ball is lifted from its flush seat, a valve means co-ordinated with the sleeve valve and adapted to interrupt the outflow of water through said seat and into said overflow pipe while the sleeve valve is raised, means tending normally to lower the sleeve valve, and manual means to lift the sleeve valve.

6. In a floating ball flushing valve for water closets, a tank for water, a float ball entirely disconnected, a cage surrounding the ball to limit its floating movements and having a top adapted to be opened and closed to permit replacement of the ball, a valve seat with a discharge port and an overflow port connected to an overflow pipe, a discharge valve adapted to close the discharge port and having movable therewith an overflow cutoff valve adapted to open and close said overflow port, and means to lift the float ball from its seat and admit water from the tank into the discharge port when the said port and the overflow port are closed by their respective valves, and hand controlled means tending automatically to move said valves to open position and maintain open the discharge and the overflow ports.

In testimony whereof I affix my signature.

MARK W. JOHNSON.